

YAVORSKIY, V.V.; MUSHEGYAN, S.A.; TRAPEZNIKOV, N.N.

Experimental and clinical bases for using the extracorporeal  
circulation apparatus AIK-RP-62 for regional perfusion. Eksp.  
khir. i anest. 8 no.5:16-19 S-D '63. (MIRA 17:6)

*In-Ta eksperimental'noy i klinicheskoy onkologii  
AMN SSSR i Nauchno-issledovatel'skiy  
Institut Eksperimental'noy Khirurgicheskoy  
Apparatury i Instrumentariya, Min Zdrav.  
SSSR*

USSR / Human and Animal Morphology, Normal and Pathological.

S-1

Abs Jour : Ref Zhur - Biol., No 18, 1958, No 83606

Author : Yavorakiy, V. Ya.

Inst : Military Medical Academy

Title : Case of an Additional Pancreas in the Stomach Wall

Orig Pub : Tr. Voen.-med. akad. 1957, 76, 182-189

Abstract : No abstract.

Card 1/1

YAVORSKIY, Ye. I., inzh; YARMOLENKO, G.Z., inzh.

Equipment for placing precast reinforced concrete supports.  
Shakht. strel. 5 no.5:23-24 My '61.

(MIRA 14:6)

1. Nauchno-issledovatel'skiy gornorudnyy institut..  
(Mine timbering)

YAVORSKIY, Yu., komandir zvena (Nikolayev); PICHINKIN, I., zamestitel'  
komandira podrazdeleniya (Kherson)

Airplanes and helicopters go out on the fields. Grazhd. av. 22  
no.5:16-17 My '65. (MIRA 18:7)

YAVORSKIY, YU., and KHEYFETS, L., Engineers

"Utilization of Natural Gas in Airports," Grazhdanskaya Aviatsiya, no. 1, pp. 23-24,  
1956

Translation D 493096

SOV/125-58-12-8/13

AUTHORS: Yavorskiy, Yu.D., Litvinchuk, M.D. and Prikhod'ko, P.M.

TITLE: An Automatic Machine for Butt Welding Mass Produced Bars  
(Avtomat dlya stykovoy svarki sterzhney massovogo proizvodstva)

PERIODICAL: Avtomaticheskaya svarka, 1958, <sup>11</sup> Nr 12, pp 63-69 (USSR)

ABSTRACT: A new method of butt welding valve blanks, based on the use of an automatic drive, has been developed. The high dynamic qualities of the drive eliminate the formation of cavities (podgar) in blanks welded by the rigid welding process. A new automatic machine for contact butt welding of 10 to 14 mm valves was designed and is now being tested at the Yaroslavl' Automobile Plant. A detailed description of the design and operation of the new device is given. It has a capacity of 300 to 400 blanks per hour and produces high quality welds. There are 3 diagrams and 3 microphotos.

Card 1/2

SOV/125-58-12-8/13

An Automatic Machine for Butt Welding Mass Produced Bars

ASSOCIATION: Institut elektrosvariki imeni Ye.O. Patona (Institute of  
Electric Welding imeni Ye.O. Paton)

SUBMITTED: September 27, 1958

Card 2/2

S/125/60/000/008/005/012  
A161/A029

AUTHORS: Lebedev, V.K.; Yavorskiy, Yu.D.

TITLE: Using Similarity Criteria for Selection of Resistance Welding Process Parameters

PERIODICAL: Avtomaticheskaya svarka, 1960, No. 8, pp. 37 - 44

TEXT: For the first time a physical model of a weld joint had been used by D.S. Balkovets (Ref. 1) in 1952, for checking calculations of electric energy needed for the formation of a spot weld. In the present work, the similarity of electrical, mechanical and heat processes is discussed as a means for determining the resistance welding process parameters for geometrically similar joints from the same material. Formulae are suggested expressing the similarity criteria of electric fields in conductors, of heat propagation and deformation, and eleven parameters are determined: 1) The diameter of the electrode contact surface for spot welding; 2) the pressure of the electrode; 3) the short circuit resistance of the welding machine; 4) the welding current frequency; 5) the voltage on parts being joined; 6) the welding time; 7) the welding current; 8) the welding current density; 9) the speed of fusion (for seam welding as well as spot

Card 1/2



S/125/60/000/008/005/012  
A161/A029

Using Similarity Criteria for Selection of Resistance Welding Process Parameters

welding); 10) allowances for fusion and upsetting, and 11) the mass of the welding machine mobile parts. Tests have been carried out with spot welding of sheets and crossed rods, resistance butt and flash welding, and the conclusion was drawn that the suggested method is practically applicable and that it will reduce the amount of experimental work. The available equipment may be employed for determining the parameters of new welding machines. There are 4 figures and 7 Soviet references. ✓

ASSOCIATION: Ordona Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O. Patona AN UkrSSR (Electric Welding Institute "Order of the Red Banner of Labor" im. Ye.O. Paton of the Academy of Sciences of the Ukrainian SSR)

SUBMITTED: March 28, 1960

Card 2/2

YAVORSKIY, Yu.D.

Physical modeling of resistance welding with continuous  
flashing. Avtom.svar. 18 no.11:40-43 N '65.

(MIRA 18:12)

1. Institut elektrosvariki im. Ye.O.Patona AN UkrSSR.  
Submitted February 8, 1965.

YAVORSKIY, Yu.D.; LEBEDEV, V.K.

Conditions of spot welding low-carbon steel. Avtom. svar. 16  
no.8:38-46 Ag '63. (MIRA 16:8)

1. Institut elektrosvariki imeni Ye.O. Patona AN UkrSSR.  
(Steel—Welding) (Electric welding)

MALEVSKIY, Yu.B.; GRABIN, V.F.; VASIL'YEV, V.G.; YAVORSKIY, Yu.D.

Alloys of copper with cobalt and silicon for the electrodes of  
resistance welding machines. Avtom, svar. 16 no.8:47-57 Ag '63.  
(MIRA 16:8)

1. Institut elektrosvarki imeni Ye.O. Patona AN UkrSSR.  
(Electric welding--Equipment and supplies)  
(Electrodes, Copper)

ACC NR: AP7004755

SOURCE CODE: UR/0413/67/000/001/0051/0051

INVENTOR: Yavov'skiy, Yu. D.

ORG: none

TITLE: Method of spot welding honeycomb structures. Class 21, No. 189958 [announced by Electric Welding Institute im. E. O. Paton (Institut elektrosvarki)].

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 1, 1967, 51

TOPIC TAGS: spot welding, honeycomb structure, ~~honeycomb structure~~  
~~spot welding~~ *electrode*

ABSTRACT: This Author Certificate introduces a method of spot welding honeycomb structures (see Fig. 1). A lower electrode, located between the core

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UDC: 621.791.763.037

ACC NR: AP7004755

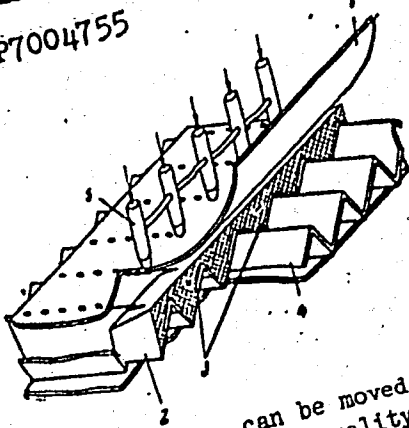


Fig. 1. Method of spot welding honeycomb structures  
1 - Face; 2 - lower electrode; 3 - current conductors; 4 - core; 5 - upper electrodes (clamps).

and the face, can be moved as the welding progresses. To simplify production and to improve the quality of welded joints in a thick-walled face, the welding current is fed to the core through the bottom electrode while the face, during welding, is held tight to the core by upper electrodes. Orig. art. has: 1 figure. [TD]

SUB CODE: 13/ SUBM DATE: 28 Dec 65/ ATD PRESS: 5117

Card 2/2

APPROVED FOR

YAVORSKIY, Yu.V.

Lastex knitting on a flat double-rib machine by the method of  
redistributing the thread. Obm.tekh.opyt. [MLP] no.36:31-32  
'56. (MIRA 11:11)

(Knitting machines)

(Elastic fabrics)

YAVOROVSKIY, L.I.; ISAKBAYEVA, S.Ye.

Treatment of funicular myelosis with endolumbar injection of vitamin B12 [with summary in French]. Zhur.nevr. i psikh. 57 no.2: 187-190 '57. (MLRA 10:6)

1. Rizhskaya respublikanskaya klinicheskaya bol'nitsa (glavnyy vrach - kandidat meditsinskikh nauk F.F.Grigorash).  
(MYELOSIS, ther.

funicular, endolumbar inject. of vitamin B12)  
(VITAMIN B12, ther. use  
myelosis, funicular, endolumbar inject.)



YAVORSKOVSKIY, L. I. and MAY, L. A.

"Vitamin B<sub>12</sub> Permeability of the Barrier between Blood and the Cerebrospinal Fluid."

"Concerning the Vitamin B<sub>12</sub> content of the Serum in Leukemia."

reports to be submitted for the Second European Symposium on Vitamin B<sub>12</sub> and Intrinsic Factor, Hamburg, West Germany, 2-5 Aug 1961.

Dept. of Hematology, Riga Republic Clinical Hospital .

YAVOYSH, E. I. (Engr)

YAVOYSH, E. I. (Engr) -- "Investigation of the Inaccuracy of Geometrical Form of Cylindrical Members." Sub 11 Apr 52, Moscow Automotive Mechanics Inst (Disseration for the degree of Candidate in Technical Sciences)

SO: Vechernaya Moskva, January-December 1952

*Yavoysh, Eduard, Ivanovich*

PHASE I BOOK EXPLOITATION

365

Tarasevich, Yuiry Sergeyevich, and Yavoysh, Eduard Ivanovich

Dopuski, ~~posadki~~ i tekhnicheskkiye izmereniya (Tolerances, Fits and Technical Measurements) Moscow, Mashgiz, 1957. 159 p.  
20,000 copies printed.

Reviewer: Ryabov, N. N., Engineer; Ed.: Smirnov, B. V., Engineer;  
Ed. of Publishing House: Morozova, M. N.; Technical Ed.:  
El'kind, V. D.; Managing Ed for literature on metal working and  
tool making (Mashgiz): Beyzel'man, R. D.

PURPOSE: The book is designed to serve as a textbook in technical schools; it was approved by the Learned Council of the Main Administration for Labor Reserves under the Council of Ministers of the USSR. It can also be used by workers in the machine-building industry.

COVERAGE: The book outlines the basic principles of accuracy of mated parts; it describes the tolerances and fits required in designing and manufacturing machinery. The methods of measurement used in the machine-building industry are discussed, and the designs and

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# Tolerances, Fits and Technical Measurements

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kinematics diagrams of various apparatuses for inspection and engineering measurement are given. Activity in this field is in line with the modern trend in machine building toward complete replaceability of parts. The authors make reference to Shelaumov, P. M., Engineer, who in 1919 suggested a system of tolerances and fits; they mention Prof. Gattsuk, A. D., under whose guidance the Committee of Standards (KES) developed the first system of tolerances and fits. This system was approved in 1929 by the Committee of Standardization under the Council of Labor and Defense on the recommendation of Prof. Saverin, M. A., chairman of a special commission, and was subsequently put into general use; it is now known as the All-Union Standard (OST). There are 29 references, all of which are Soviet.

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# Tolerances, Fits and Technical Measurements

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<p>CA</p>		<p>9</p>	
<p><b>Causes of clogging of acid open-hearth regenerators with dust and slag.</b> V. I. Yavobkil and L. S. Matyukha. <i>Stal.</i> 3, No. 11/12, 15-20(1913).—Combustion products taken from the cinder pockets contained 0.02-0.5 g. of solids per cu. m.; samples taken at the openings of the uptake and downtake (leading to the checker work) contained 3 times these amts. of solids. There were 2 maxima for cinder content in the combustion product; the first 1-1.5 hrs. after the end of charging, the second when the bath boiled most intensely. There was a minimum during the charging period, and another during the killing period. The maxima occurred at the times when the fused metal was not covered by slag. Dust deposited on the gas and the air regenerators, resp., contained SiO<sub>2</sub> 38.2, 20.1; Fe<sub>2</sub>O<sub>3</sub> 1.2; Fe<sub>2</sub>O, 1.1, 50.7; MnO 1.2, 1.1; Al<sub>2</sub>O<sub>3</sub> 1.3, 2.5. The main source of dust in an acid furnace is evapd. Fe. In contact with the furnace gases, the Fe is converted into Fe<sub>2</sub>O<sub>3</sub>. At approx. 1627° Fe<sub>2</sub>O<sub>3</sub> solidifies and is carried as dust. When the dust settles it reacts with SiO<sub>2</sub> to form grunerite or fayalite and kuebelite. Because of a diminution in the d., connected with the change from magnetite to grunerite the deposit in the air passages is porous; the deposit in the gas passages is quite different in appearance, apparently because of the reducing action of the gas. The corrosive action on the acid lining is inherent in the nature of an acid furnace. Consequently it cannot be completely eliminated. M. Hosh</p>			
<p>ASB 354 METALLURGICAL LITERATURE CLASSIFICATION</p>			

*CA*

Yavolskii, V. I., and Medvedeva, G. A.: Determination  
of Gases and Nonmetallic Inclusions in Steel. Moscow:  
Metallurgizdat, 1945. 167 pp. Reviewed in Zashchit-  
skaya Lab. 12, 802(10-40).

ASR-SLA METALLURGICAL LITERATURE CLASSIFICATION

NIKOLAYEV, Ye.I.; KRYAKOVSKIY, Yu.V.; TYURIN, Ye.I.; YAVOYSKIY, V.I.

Chemical heterogeneity and nonmetallic inclusions in ingots of steel  
with rare-earth metals. Izv. vys. ucheb. zav.; chern. met. 8 no.7:37-  
42 '65. (MIRA 18:7)

1. Moskovskiy institut stali splavov.

YAVOYSKIY, V. I.

"Effect of Silicates, Sulfide Inclusions and Gases on Steel Quality," *Stal'*,  
No.5, pp 393-98, 1945

Evaluation B-60430

PROCESSING AND TRANSMISSION DATA																									
MATERIALS INDEX													PROCESSING DATA												
MATERIALS INDEX													PROCESSING DATA												
CA													9												
<p>Nonmetal and gas inclusions in ferroalloys. V. I. Yavot-kil. <i>Trudy Ural. Ind. Inst. im. S. M. Zhukovskiy</i>, No. 20, 4-20(1945).--The present investigation deals with the gas absorption of alloying components and denitrogenizers, and with the effect of alloying components on the solubility of gases in the molten metal. Ferrosilicon, ferromanganese, and ferrochrome were investigated. The analysis of nonmetal inclusions in ferrosilicon is not very successful. The O method for detg. H in ferrosilicon gave reliable results. Generally the ferrosilicon contg. the most Si had the lowest H content. A porous honeycombed fracture is an indication of the presence of H. Both electric and blast-furnace ferrosilicon contained H, in amts. varying within wide limits. Both the lower and upper limits of H content in ferrosilicon made in blast furnaces were higher than in electrically made ferrosilicon. In ferromanganese (all kinds) the ratio of Mn concn. to the concn. of H was approx. the same. Silicomanganese contained higher concns. of both H and N than ferromanganese. Blast-furnace ferromanganese contained 12-13 times more of siliceous inclusions than electrically made ferromanganese. However, since these silicates are low-melting, the 2 kinds of ferromanganese can be considered equiv. Ferrochrome made in blast furnaces contained less of gaseous inclusions and more siliceous and aluminous inclusions. Ferrochrome made in electric furnaces contained in some instances up to 2% of metallic Al. This may lead to the formation of <math>Al_2Si_5</math> and <math>Al_2O_3</math>, which lower the malleability and plasticity of the cold steel. It is therefore imperative to limit the reduction of Al in the firing of ferrochrome in electric furnaces. M. Hirsch</p>																									
<p>ASR-31A METALLURGICAL LITE</p>																									

STANDARD AND PROPERTY INDEX		STANDARD AND PROPERTY INDEX	
<p><b>CA</b></p> <p><b>Determination of hydrogen in steel.</b> V. I. Yavitskiy. <i>Zavodskaya Lab.</i> 11, 400-15(1945). -- The total H content of steel can be divided into 3 fractions: (a) the H liberated in a vacuum at 150-200°, which comprises principally the mol. H contained in the pores of the metal and that adsorbed on the surface. (b) the H oxidized at 900-1000° which comprises the H dissolved in the steel, and (c) the H oxidized at a temp. close to or above the m.p. of the steel, which comprises the H not liberated from the center of the sample at 900-1000° and the chemically combined H. Fraction a is detd. in an app. similar to the one described by the Bureau of Standards by measuring the differential pressure of the liberated H in the reaction tube. The fractions b and c are detd. as water vapor absorbed by P<sub>2</sub>O<sub>5</sub>. Fraction c is detd. after the complete oxidation of the steel. The method is applicable only to steels of a low C content; app. and procedure are described. J. Davidson.</p>		<p><b>7</b></p>	
<p>ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION</p>			
<p>RECORD NUMBER</p>		<p>RECORD NUMBER</p>	
<p>RECORD NUMBER</p>		<p>RECORD NUMBER</p>	



PROCESSING AND PROPERTIES INDEX									
7									
<p>3 OXIDATION AND REDUCTION REACTIONS OF CHROMIUM IN THE BASIC AND ACID PROCESS. V.I. Yavioskii and S.K. Dzenyan. (Stal, 1947, vol. 7, pp. 302-309 (in Russian); Chemical Abstracts, 1949, vol. 43, Feb. 25, col. 1295). The oxidation of chromium in the melt and its reduction in the slag were studied. Under acid conditions, the coefficient of chromium distribution between the melt and slag <math>(\%Cr)/[Cr]</math> increased somewhat as the temperature decreased below 1600°. As <math>(FeO)</math> increased, this coefficient increased considerably. As the concentration of chromium in the slag increased, the solubility of <math>SiO_2</math> decreased. In acid slags the greater part of chromium is in the form of <math>Cr_2O_3</math>. In basic furnaces the distribution of chromium was affected primarily by the amount of <math>FeO</math> in the slag. Notwithstanding that the <math>Cr_2O_3</math> in the slag was in some cases 20%, the viscosity of the slags was not unduly high. While the basicity of the slag did not affect the <math>(\%Cr)/[Cr]</math>, <math>(\%P)/[P]</math> increased with the basicity.</p>									
<p>ASIA SLA METALLURGICAL LITERATURE CLASSIFICATION</p>									
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Transfer of gases to metal through slag. V. J. Yavol'skiĭ, *Stal* 7, 700-807 (1947).—Samples of metal and slag were withdrawn from basic and acid open-hearth furnaces and elec. furnaces during a run and their O and H detd. It was assumed that in most samples there was little likelihood that H distribution attained equil., and from the difference in [H] and (2H) before and after sampling it can be judged whether the relation (2H)/[H] in the given sample is above or below the equil. value; the same reasoning is applicable to the distribution of Mn and Fe. As the temp. increased, the equil. value (2H)/[H] decreased; for acid melts (2H)/[H] was lower than for basic ones but this difference diminished with increasing temp.; and at no temp. was the system in equil. By relating (2H)/[H] to (CaO)/(SiO<sub>2</sub>) in the slag, it was observed that the very basic slags were farthest from equil. with respect to H. No relation was observed between (2H)/[H] and the FeO and MnO in the slag or the coeff. (MnO)/[Mn]. The most likely form in which H is present in slag is considered to be OH<sup>-</sup>. Its transfer from the slag to the metal proceeds according to:  $Fe^{++} + 2OH^{-} \rightarrow Fe + 2H + 2O$  and  $Mn^{++} + 2OH^{-} \rightarrow Mn + 2H + 2O$ . The resp. consts. are given by  $K_{Fe, H} = \frac{[OH^{-}]^2/[H][O]}{[Fe^{++}]/[Fe]}$  and  $K_{Mn, O} = \frac{[OH^{-}]^2/[H][O]}{[Mn^{++}]/[Mn]}$ . As first approximation, the thermodynamic function for the 2 equations was calcul. to be  $\Delta F^{\circ} = 275,000 - 140 T$  and  $\Delta F^{\circ} = 354,000 - 180 T$ .

resp. The soly. of N in slag was studied at 500-1350° using synthetic slags. At any given temp. the soly. of N was almost a straight line function of  $\log (FeO)/(MnO)$ . The N absorbed at elevated temps. desorbed with difficulty upon cooling. Of the several nitrides formed  $Mn_3N_4$ ,  $Fe_3N_4$ , and  $Si_3N_4$  are volatile; they volatilize intensely at

1350°. Most volatile is  $Mn_3N_4$ ; it is also less sol. in slag than  $Fe_3N_4$ . The thermal effect for the formation of nitrides was calcul. to be: for  $8FeO + N_2 \rightarrow 2Fe_3N_4 + 4O_2$ ;  $\Delta H = -514,000$ , and for  $5MnO + N_2 \rightarrow Mn_3N_4 + 2\frac{1}{2}O_2$ ;  $\Delta H = -130,000$ . M. Hosh

ASH-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

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S

Determination of Hydrogen in the Course of Smelting.  
V. I. Yavolskii. (Zavodskaya Laboratoriya, 1947, vol. 13, pp. 262-275; Chemical Abstracts, 1948, vol. 42, May 20, col. 3283). The Heety sampler was modified to make possible sampling from the furnace or from under the slag. Aluminum strip or wire (1-1.5 mm) and weighing 0.8-1% of the sample is so positioned in an arm (8-10 mm in dia) of the sampler that the stream of molten metal comes in contact with the aluminum before it enters the arm. The metal in the arm is used to determine hydrogen by the oxidation method, by using an improved oxidation apparatus; the oxygen and nitrogen are determined in the metal of the upper part of the sampler. The process of melting and oxidation can be regulated not only by the strength of the high-frequency current but also by regulating the height at which the specimens are suspended. Experiments with molten iron containing carbon 0.02%, using a high-frequency vacuum furnace, have shown that, the addition of aluminum does not affect the solution of hydrogen and that only for aluminum concentrations of over 0.75% does the solution of hydrogen begin to decrease.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

SECOND DIVISION	THIRD DIVISION	FOURTH DIVISION
100000 #1	100000 #2	100000 #3
100000 #4	100000 #5	100000 #6
100000 #7	100000 #8	100000 #9
100000 #10	100000 #11	100000 #12
100000 #13	100000 #14	100000 #15
100000 #16	100000 #17	100000 #18
100000 #19	100000 #20	100000 #21
100000 #22	100000 #23	100000 #24
100000 #25	100000 #26	100000 #27
100000 #28	100000 #29	100000 #30
100000 #31	100000 #32	100000 #33
100000 #34	100000 #35	100000 #36
100000 #37	100000 #38	100000 #39
100000 #40	100000 #41	100000 #42
100000 #43	100000 #44	100000 #45
100000 #46	100000 #47	100000 #48
100000 #49	100000 #50	100000 #51
100000 #52	100000 #53	100000 #54
100000 #55	100000 #56	100000 #57
100000 #58	100000 #59	100000 #60
100000 #61	100000 #62	100000 #63
100000 #64	100000 #65	100000 #66
100000 #67	100000 #68	100000 #69
100000 #70	100000 #71	100000 #72
100000 #73	100000 #74	100000 #75
100000 #76	100000 #77	100000 #78
100000 #79	100000 #80	100000 #81
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CA

**Distribution of gases in hearths of high-capacity open-hearth furnaces.** V. I. Yavolaki and H. A. Popyrev. *Stal* 8, 1075-80 (1948). --The purpose of this investigation was to det. the gas content and the nonmetal impurities at various depths of 350- and 185-ton open hearths. Samples were taken at various depths (1) 15-20 min. after melting, (2) at the beginning of the boil (C 0.35-0.45%), (3) before deoxidation, and (4) 4-6 min. following oxidation. Simultaneously, metal and slag samples were taken for routine analyses, the temp. was detd., and H was uneven, the slag. The distribution of H, N, and O was uneven, much more so than the distribution of, e.g., C, Mn, P, and S. Until the heat is degasified the concn. of H increased in the direction from the bottom toward the under-slag level, whereas, during degasification the H concn. increased in reverse direction. The concn. of N generally increased in upward direction. The distribution of O was irregular. Degasification in large open hearths was fully as effective as in small ones. Boiling reduced the H to 0.0014-0.0009% and N to 0.0020-0.0025%. Boiling

at a rate exceeding 30 cu.m. CO per sq.m. hr. or lasting over 2 hrs. was superfluous. The same kind of metal from the large hearths contained no more gases than metal from 50-ton hearths. Under equal conditions of smelting and deoxidation, the metal from the 350-ton hearth contained only little more silicate occlusions than the metal from the 185-ton hearth. M. Hosh

YAVOYSKIY, V.I., professor, doktor tekhnicheskikh nauk; GEL'D, P.V.,  
~~doktor tekhnicheskikh nauk~~, otvetstvennyy redaktor; KOVALENKO,  
N.I., tekhnicheskiiy redaktor

[Gases in steel smelting furnace hearths] Gazy v vannakh stale-  
plavil'nykh pechei. Sverdlovsk, Gos. nauchno-tekhn.izd-vo lit-ry  
po chernoi i tsvetnoi metallurgii, 1952. 243 p. [Microfilm]  
(Smelting furnaces) (MLRA 7:10)  
(Gases in metals)

YAYOYSKIY, V. I.

USSR/Metallurgy - Ferrochromium

May 52

"Solubility of Nitrogen in Iron-Chromium Alloys," K. T. Kurochkin, P. V. Gel'd,  
V. I. Yavoyaskiy, Ural Polytech Inst Imeni S. M. Kirov, Sverdlovsk

"Dok Ak Nauk SSSR" Vol 84, No 2, pp 329-332

Investigates soly of N in liquid Fe-Cr alloys, contg 3.56 to 66% Cr, at N pressure of 735 and 512. Tabulates and compares results with those obtained by American investigators R. M. Brick and L. A. Greevy, showing similarity in general dependence of N soly on Cr concn. Certain discrepancy in abs values of data is explained by higher N content in solidified metal in which condition Brick and Greevy conducted their investigation. Submitted by Acad S. I. Vol'fkovich  
17 Mar 52.

231T59

YAVOISKIY, V. I.

USSR 1

✓ Solubility of hydrogen in liquid cupola iron. V. I. Lakomskii and V. I. Yavolskii, *Litelsne Proizvodstvo* 1954, No. 5, 20-3.—Irons were melted in an evacuated system, molten metals treated with H for reducing reducible oxides, and the system re-evacuated and a given quantity of H<sub>2</sub> admitted under pressure of 20-40 mm. of Hg. Pressure was measured with a McLeod gage every 20-30 sec. The equil. between the gaseous phase and iron was reached usually in 5-8 min. Then the gases of the system were aspirated into the analyzer, their compn. detd., and partial pressure of the equil. calcd. The compn. of Fe could be changed without breaking the vacuum. All samples were melted in a magnesite crucible previously heated to 1700-1750° and treated with H. An iron with C 0.03, Si 0.11%, Mn 0.07, S 0.03, P 0.02% dissolves at 1530-40° from 24.5 to 23.5 ml. H/100 g. Cast iron with 2.78-3.8% C dissolved at 1300° resp., 14.1 and 12.5 ml. H/100 g. showing a sharper decrease of soly. at lower C concn. Temp. increases the soly. of H by 0.5 ml./100 g. for each 100° in the interval of 1275-1420°. Si (1.0-3.0%) added to Fe-C system lowers H soly. at a faster rate at lower concns., shown in diagrams. Mn rapidly evaporates from its alloys with Fe, the vapor pressure of it at 1300-1700° being 1 g. P = -13280 T +

8.628, though in cast irons 0.19-0.20% Mn remains at 1500-50° held apparently as carbides. In these expts. it was added in increments of 0.1% Mn starting at 1420° and reducing the temp. at each subsequent addn. to avoid vaporization. A matter of 0.3% Mn increases H soly. from 13 to 21 ml./100 g., but the presence of Si changes the trend. No Mn hydrides are apparently formed. A 5-10% drop of soly. was noted on adding 0.07-0.10% Mg as a 10% Mg-Si alloy at 1275°.

J. D. Oat

YAVOYSKIY, V. I.

4

Gas content of magnesium-bearing iron, V. I. Lakomskii and V. I. Yavolskii, *Litenskoe Proizvodstvo* 1955, No. 12, 20-2.—The study was conducted on irons alloyed with 0.4% Mg cast in pencil test bars and analyzed for their gas content by vacuum fusion. In all tests addn. of Mg reduced both H and O concn. With the original H content of 3.68 ml./100 g. of metal, it was reduced by 50-6%, and when present in concn. of 1.57-2.51 ml./100 g. by 31-41%, the element passed from the liquid metal into the stream of Mg vapor. When the iron is cooled fast enough to produce a chilled fracture, it loses a portion of its H on storage, but a gray iron with lamellar pearlite retains all of it when held at room temp. in a vacuum. When graphitic lamellae are formed, they are in continuous contact with the base metal supersatd. with H, permitting an easy adsorption of the element by graphite. Nodulized graphite is formed from austenite which serves as an insulator for H migration from the liquid metal. In iron with a lamellar graphite, most H is present in the latter, and in nodulized iron it is found in metallic matrix causing it to contain 40-50% less H than the former. Comparatively high percentage of porous castings made of Mg-bearing iron is explained by Mg reacting with the moisture of the molds. J. D. Cat

pm

of



Yavol'skiy, V.I.

Gases in steel made in fast-working, large, open-hearth furnaces. V. I. Yavolskiy (Polytech. Inst., Kiev). Stal 15, 606-13(1966).—A study of nineteen 185-ton heats made in all-basic furnaces within 5-7.35 hrs. from tap to tap showed that the gas content of the metallic charge had but little effect in the pig-ore process and somewhat more when the scrap-pig method was used. Hot melting did not increase the H content. Most gas can be removed by boiling, which should be at a certain min. rate. More basic slags having greater viscosity reduce H concn. by slowing slag-metal equil. in respect to H. Gas pickup is very pronounced during the delays in the finishing period.

I. D. Gat

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CIA-RDP86-00513R001962320003-5"

USSR / Physical Chemistry. Crystals

B-5

Abs Jour : Ref Zhur - Khimiya, No 8, 1957, 25896

Author : V.I. Yavoyskiy, D.F. Chernega

Title : Migration of Hydrogen in Hard Steel Under Influence of Electric Field.

Orig Pub : Stal', 1956, No 9, 790 - 793.

Abstract : Hydrogen moves from the anode to the cathode in a constant electric field in specimens of highly and medium carbon steels, as well as in Mn steels. This shows that hydrogen is present in steel as  $H^+$ . This effect is not present in low-carbon and Si steels.

Card : 1/1

YAVOYSKIY, V., and SEN, P.K.,

"Continuous Casting of Steel," Information Bulletin,

papers to be presented at 11th Annual Technical Meeting of Indian Inst. of Metals  
Bombay, India, 1-5 Dec 57.

YAVOYSKIY, V., and S. Raoy.

"Hydrogen in Steel-Melting Processes," Information Bulletin,

papers to be presented at 11th Annual Technical Meeting of Indian Inst. of Metals,  
Bombay, India, 1-5 Dec 57.

SOV/137-58-7-14354

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 57 (USSR)

AUTHOR: Yavoyskiy, V.I.

TITLE: Methods of Reducing the Saturation of Steel With Gas (Puti snizheniya gazonasyschennosti stali)

PERIODICAL: V sb.: Fiz.-khim. osnovy proiz-va stali. Moscow, AN SSSR, 1957, pp 515-533. Diskus. pp 650-655

ABSTRACT: Examination is made of methods of combatting gases (G) in St in the light of the fundamental changes that have occurred in steelmaking technology. With high-speed heats and furnaces (F) of high thermal capacity (up to 40 mill. cal/hr), boil is a dependable method of removing gas from steel (St). It is necessary to reduce the length of time that the bath is held at low rates of C oxidation.  $v_{C}^{crit}$ , according to the author's data for a 185-t hot-working F, is  $\sim 0.4\%$  C per hour and is dependent upon the partial pressure of the water vapors in the metal-soaking pits, etc. The higher the temperature of the metal, the higher the [N]. Boiling causes insignificant removal of nitrogen. The [O] in hot F is lower in the course of refining to 0.10-0.12% C than in F of lower thermal capacity. The

Card 1/3

SOV/137-58-7-14354

# Methods of Reducing the Saturation of Steel With Gas

marked oxidation of St of the 08 KP type during effervescence in the molds is most distinctive. Thus, at 1630°C, the composition of the metal in the upper portion of a 9-t ingot for sheet changed in 18 minutes of boil from 0.07% C and 0.068% O to 0.02% C and 0.126% O. The slag cover plays a major role in protecting the St against saturation with gases in the smelting of killed grades of St. It is important to attain early formation of slag (SL) with good wetting of the metal (this is possible, for example, when glauconite ores or nepheline fluxes, etc., are employed). In the period of boil without ore addition, low permeability of the SL to gas is of particular importance. This is attainable either by reducing the solubility of H in the SL in the (OH<sup>-</sup>) form or by increasing the viscosity of the SL. Reduction of the solubility of the H may be accomplished by magnesia-alumina SL of the following % composition: FeO 12-14, MnO 11-13, MgO 12-16, CaO 30-34, SiO<sub>2</sub> 16-17, and Al<sub>2</sub>O<sub>3</sub> 10-15. Their viscosity is 80-100 mm on the Gerti viscosimeter. However, the known methods of utilizing SL as a medium for protection against G suffer the shortcoming that P and S removal is poor when they are employed. The author notes that the known methods of combatting gases, particularly H<sub>2</sub>, are not sufficiently effective, particularly in certain instances of the smelting of high-grade St, and suggests that new methods be tried: the utilization of Ar, Ne, He, and N<sub>2</sub> in blowing the metal

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SOV/137-58-7-14354

Methods of Reducing the Saturation of Steel With Gas

and also in creating a shielding atmosphere during tapping of the St and in filling of the molds; treatment of the St with liquid or solid synthetic SL, removal of H from St by means of a direct electrical current, and mechanical agitation (shaking) during pouring.

S.S.

1. Steel--Processing
2. Gases--Reduction
3. Steel--Temperature factors

Card 3/3



SOV/137-58-11-22137

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 11, p 44 (USSR)

AUTHORS: Yavoykiy, V. I., Chernega, D. F., Telesov, S. A., Troskunov, Ya. L., Ofengenden, A. M., Bekker, N. I.

TITLE: D-C Degassing of Steel in Ladles and Molds (Degazatsiya stali v kovshakh i izlozhnitsakh pri pomoshchi postoyannogo elektri-cheskogo toka)

PERIODICAL: Sb. Mosk. in-t stali, 1958, Vol 38, pp 209-225

ABSTRACT: Carbon and low-alloy steels (65G, 55S2, 10G2A, Nr 45, and others) were the objects of investigation. In degassing in molds, either the graphite nozzle or the stool serves as anode, while a graphite electrode immersed in the mold serves as cathode. Current is transmitted for 10-30 min, usually immediately after the ingot is poured. The ingots are 3.1-3.4 t in weight. Samples of the metal (Me) for H determination by the Batalin method are taken from the test ingot and the next one adjacent thereto (the control ingot). Seven ingots were treated in this manner. Increase in current density from 0.06 to 0.17 amps/cm<sup>2</sup> raises the [H] in the top of the test ingot to more than in the control ingot. The difference in [H] attains 15.84

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SOV/137-58-11-22137

D-C Degassing of Steel in Ladles and Molds

$\text{cm}^3/100 \text{ g}$ . Samples of Me taken from rolled ingots (100-160 mm diam) testify to positive segregation of H, a uniform distribution of [N], and some improvement in macrostructure. When Me is degassed in 125-t ladles, the current is delivered through carbon coils mounted on dummy stoppers. The current, of 0.02-0.25  $\text{amps/cm}^2$  density, is transmitted either while the metal is in the ladle or then and, in addition, when it is poured. 12 heats were run. Samples of Me were taken during pouring from the molds. In the experimental heats, the [H] in the ladle was reduced relative to the [H] before tapping by 1.5-2  $\text{cm}^3/100 \text{ g}$  and was 0.5-1.0  $\text{cm}^3/100 \text{ g}$  lower than in ordinary heats. The Me treatment thus described does not affect the content and distribution of N, O, or nonmetallic inclusions.

A. S.

Card 2/2

Yavoytskiy, V. I.

GRIGORYEV, B.P.; KOROLEV, B.G.; YAVOYTSKIY, V.I.; AMOSOV, V.Y.

K voprosu o kinetike oksleniya fosfora v  
staloplavilnykh protsessakh.

report submitted for the 5th Physical Chemical Conference on  
Steel Production.

MOSCOW 20 JUN 1958

YAVOYSKIY, V.I.

18(7)

PHASE I BOOK EXPLOITATION

SOV/3456

Lakomskiy, Viktor Iosifovich, and Vladimir Ivanovich Yavoyskiy

Gazy v chugunakh (Gases in Cast Iron), Kiyev, Gos. izd-vo tekhn. lit-ry  
USSR, 1959. 167 p. Errata slip inserted. 1,200 copies printed.

Ed.: L. Raytburd; Tech. Ed.: N. Velichko

**PURPOSE:** This book is intended for technical personnel at machine-building and metallurgical plants. It may also be used by students specializing in the field of casting.

**COVERAGE:** The book deals with interactions between gases and foundry pig when melted in cupolas, flame furnaces, and electric furnaces, and utilizes recent data on the solubility of, and forms assumed by, hydrogen, nitrogen, and oxygen in cast iron. Attention is given to defects in castings caused by a high gas content (gas cavities, honeycomb blowholes, hot and cold cracks, superficial formation of cementite, etc.). The principal sources of gases in cast iron under conditions of melting, teeming, and formation of castings are described. Methods of controlling casting defects are discussed, and recommendations are given for reducing the gas content of cast iron and preventing

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Gases in Cast Iron

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the saturation of molten foundry pig with gases. There are 152 references, of which 90 are Soviet, 50 English, 5 German, 5 French, 1 is Czech, and 1 Japanese.

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Gases in Cast Iron

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AVAILABLE: Library of Congress (TN710.L27)

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VK/fal  
4/12/60

LAKOMSKIY, Viktor Iosifovich; YAVOYSKIY, Vladimir Ivanovich;  
RAYTBURD, L., red.; GORKAVENKO, L., tekhn.red.

[Gases in cast iron] Gazy v chugunakh. Izd.2. Kiev, Gos.  
izd-vo tekhn.lit-ry USSR, 1960. 174 p. (MIRA 13:10)  
(Cast iron) (Gases in metals)

S/148/60/000/007/017/023/XX  
A161/A033

AUTHORS: Yavoyskiy, V. I.; Vishkarev, A.F.

TITLE: Oxidation of molten metal additions in steel making processes.  
Part II. Oxidation of Silicon and Phosphorus.

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya,  
no. 7, 1960, 24 - 31

TEXT: In part I it was shown that the relative oxidation rate of various elements in a steel bath which is blown through with oxidizing gas depends to a considerable degree on their surface activity in the metal-gas boundary zone. The discussions concern the oxidation sequence of silicon and phosphorus. The system Fe-C-Si is analyzed using data of D. Hilty and B. Krafts (Ref. 1: J. of Metals, 1950, No. 2), Vecher, Hamilton, Dastur, Chipman, J. F. Elliot (Ref. 2: The Carbon Oxygen Equilibrium on Liquid Iron, The physio.chem. of St. mak., Massachusetts, 1956), Gibbs and the Shishkovskiy and Langmuir equations. Joint oxidation of phosphorus and carbon, and the effect of manganese is discussed with references to previous Soviet works (Ref. 5: Yavoyskiy, V. I.; Vishkarev, A.F. Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1960, No.5; Ref. 6: Grigor'yev, V. P., Korolev, B.G. et al. Izvestiya vysshikh uchebnykh

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Oxidation of molten metal ....

S/148/60/000/007/017/023/XX  
A161/A033

zavedeniy, Chernaya metallurgiya, 1960, no. 4). As the adsorption calculations become very cumbersome for a four-component system (Fe-C-P-Mn), the calculation is carried out for a three-component system only. It is mentioned that cases are not rare when C and P oxidize simultaneously, and even S burns. The basic cause of this is supposed to be the uneven contact of metal with the oxidizing gas, for it is practically impossible to achieve a perfectly uniform air distribution in metal even by blowing through the bottom. Investigation in models revealed air jets and separate bubbles which were comparatively large. Uniform mixing of oxidizing gas with metal is even less probable in converters with the blast from the top, in open-hearth furnaces, or in rotary furnaces. Though, M. M. Karnaukhov and S. K. Chuchmarev used radioactive indicators and proved that the distribution of impurities in a boiling (or generally turbulent) bath may be described by equations similar to the molecular diffusion equations (replacing the molecular diffusion factors with "effective" or "virtual" diffusion rate factors). The available data on the rate of molecular diffusion of impurities in molten iron are scarce, and it appears that the data of A. M. Sararin and L. A. Shvartsman (Ref. 8: Izv. AN SSSR, OTN, 1947, No. 12) and Paschke and Hautman (Ref. 9: Archiv f.d. Eisenhuettenwesen, 1953, S. 305) are the most

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Oxidation of molten metal ....

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A110/A033

accurate. In general, the available data are yet too insufficient for evaluating the relative adsorption rate of various elements, or for comparison with the diffusion rate. All discussions in this work cannot yet be practically applied for the determination of the oxidation of the elements on the metal-slag boundary, for the effect of separate slag components and of the metal bath in particular on the interphase tension in the interfacial zone has scarcely been studied, and the known Antonov rule does not always seem to be applicable. Conclusions: 1) In the case of usual Bessemer iron compositions, the Si concentration is considerably higher on the surface than in the volume, and the C concentration is nearly equal on the surface and in the volume. Due to this, Si can oxidize in perfect mixing conditions to a very low content before the start of C oxidation. Thermodynamic calculations based on volume concentration cannot explain such deep Si oxidation. 2) The intense oxidation of P in Fe-C-P systems in the presence of sufficiently basic slags can be explained by the surface activeness of P. 3) The simultaneous oxidation of several elements and the lack of regularity in the sequence of their oxidation and in the thermodynamics of the surface reactions is due to nonuniform distribution of oxidizing gas in metal and the presence of zones with perfect and imperfect mixing. 4) The subsurface layers lose their impurities through adsorp-

Card 3/4

Oxidation of molten metal ....

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A110/A033

tion in the surface, and new quantities of impurities form by diffusion from deeper layers. It can be assumed (in the first approximation) that the effective diffusion rate of the metal bath components is nearly proportional to the molecular diffusion rate factors, particularly at perfect mixing of oxidizing gas with metal. Due to this the oxidization of Si and Mn can be faster in perfect mixing comparing with the oxidization of C or S (for the diffusion rate factors of Si and Mn are higher). 5) The speed of the components adsorption from the molten bath (i.e., the atoms or ions transfer from the volume to the surface) seems also to affect the metal refining in certain conditions. However, no experiment data are yet available for evaluation of this effect. There are 9 references: 6 Soviet-bloc and 3 non-Soviet-bloc. The references to English language publication read as follows: D. Hilty, B. Krafts, J. of Metals, 1950, No. 2; J. F. Elliot, The Carbon Oxygen Equilibrium on Liquid Iron. The physic. chem. of St. mak. Massachusetts, 1956.

ASSOCIATION: Mo skovskiy institut stali (Moscow Steel Institute)

SUBMITTED: 22 December 1959

Card 4/4

YAVOYSKIY, V.I.; VISHKAREV, A.F.

Oxidation of the additives to molten metal in the steelmaking process. Report No.1. Izv.vys.ucheb.zav.; chern.met. no.5: 39-48 '60. (MIRA 13:6)

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GRIGOR'YEV, V.P.; VISHKAREV, A.F.; KOROLEV, B.G.; ABROSIMOV, Ye.V.;  
YAVOYSKIY, V.I.

Effect of phosphorus and manganese on the surface tension  
of iron-carbon alloys. Izv.vys.ucheb.zav.; chern.met. no.4:  
55-65 '60. (MIRA 13:4)

1. Moskovskiy institut stali.  
(Iron alloys) (Surface tension)



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"Hydrogen and flakes of steel" by D.IA. Povlotskii, A.N. Morozov.  
Reviewed by V.I. IAvolskii. Stal' 20 no.6:505-508 Ja '60.

(MIRA 14:2)

(Steel--Defects)

(Povlotskii, D.IA.)

(Gases in metals)

(Morozov, A.N.)

S/148/60/000/009/005/025  
A161/A030

AUTHORS: Kozlov, V.I., and Yavovskiy, V.I.

TITLE: The role of bottom fritting in oxidizing processes in steel-melting

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 9, 1960, 35-42

TEXT: The influence of the bottom fritting in basic open hearth furnaces on oxidizing processes has been investigated in 250 ton furnaces melting mainly low-carbon steel. References are made to thirteen works (Ref.1-13) in which the alternating oxidizing and reducing in the fritting during the heat was considered from the angle of the effect on the furnace bottom, with only few exceptions (Ref.1,6) where the effect on the melting process was considered as well. Fritting samples were taken with a simple device consisting of a rod and a shell taking core samples. The top of the cores about 15 mm deep was taken for investigations. The composition of this surface layer changed very considerably during one heat. The lowest iron oxide content in the surface of fritting was observed towards the end

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of heat (contrary to conclusions in (Ref.6)). Apparently, silicon and manganese have the major effect on reducing of the oxides in fritting during melting, and the temperature during the melting period is not sufficient for oxidizing of carbon by the oxides of iron and bottom. In deeper layers the content of iron oxides remained high during the melting and evened out through the fritting depth at an higher temperature. (The same had been stated in (Ref.7)). Floating of low-melting fritting components into slag makes the fritting surface more refractory and rough (Ref.10), and this assists the formation of CO bubbles on the bottom and development of the "bottom" reaction of carbon oxidizing. The iron oxide content in the fritting surface diminishes, and the earlier it is free from low-melting layers with high content of calcium, silicon and aluminum oxides, the faster starts the intensive CO bubbles formation on the bottom and the lower will be the oxygen content in the metal bath. This explains also the higher content of hyper-equilibrium oxygen in metal after melting. The absolute quantity of carbon oxidized by the iron oxides from the fritting is not high (0.05-0.06% C was determined in one heat), but it is important for the development of bottom boiling. Increased content of CaO and SiO<sub>2</sub> was observed in all heats during

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higher temperature period. This indicates the opposite concentration gradient (compared with the start of heat) of these components in the fritting depth and the appearance of high-melting calcium silicates at this time. Microscopic investigation confirmed this. After the carbon content in the bath reaches about 0.10%, and decarbonization in the fritting becomes slow, the iron oxide content in it begins to grow from the higher oxygen content in liquid metal, and this lasts apparently until the moment when the bath is deoxidized. During the deoxidation of metal the sense of chemical interaction of fritting and bath changes again. During tapping, the surface of fritting becomes saturated in iron oxide from the slag as well as from the oxidizing atmosphere in the furnace and oxidation of metal beads on the bottom. The concentration of FeO and CaO in the fritting and in the final slags is completely different, and this indicates the selective absorption of iron oxide from slag by the fritting, though, I.P.Bas'yas and A.M.Lepesa (Ref.7) came to a different conclusion (but did not state the time of taking samples). Petrographic analysis of fritting samples revealed that iron oxides were present in the fritting during the heat end in the form of ferrous silicates and solid solution of wustite in periclase ("periklaz"). Magnesium ferrite starts appearing at about 0.10% C in metal. At the charging

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end a high quantity of calcium ferrite, magnesium ferrite and RO were revealed. Metal beads were absent in these samples. Conclusions: 1) The variation of iron oxide content in the fritting of the basic open hearth bottom during the heat has been studied. 2) It has been proven that iron oxides in the fritting take an active part in oxidation processes in the steel-making process. Part of the silicon and manganese in pig iron is oxidized by these oxides during the melting period. 3) The observations confirmed the opinion of some investigators that the "bottom" reaction of carbon oxidation gradually grows during the second half of the heat process. The time during which the oxidation of carbon is taken over by the furnace bottom can be different. The rate of the rise in temperature has a considerable effect on this. Iron oxides contained in the fritting on the furnace bottom take some part in oxidation of carbon. There are 5 figures and 13 references: 12 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: 16 May 1960

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S/148/60/000/011/003/015  
A161/A030

AUTHORS: Dzhoshi, V. B.; Vishkarev, A. F.; Yavoyskiy, V. I.

TITLE: The role of surface phenomena in the distribution of nitrogen between molten metal and gas phases

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 11, 1960, 36 - 44

TEXT: The effect of nitrogen on the properties of steel is considerable, and its content in converter steel is higher than in other types. Many phenomena observed concerned with the behaviour of nitrogen are not yet clear, and investigations are necessary in view of the increasing extensive use of the converter process, particularly of the oxygen process. No reliable data are available on the effect of carbon on the nitrogen absorption rate, and only indirect data make some conclusions possible. The measurement of surface tension at high temperatures is only possible with two methods: "recumbent drop" and maximum pressure in the bubble". The latter was used in the described experiments at the Moscow Steel Institute.

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The role of surface phenomena in ....

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The measuring installation was similar with the one formerly described (Ref. 6 - 7: 6 - S. I. Filippov, book "Theory of steel decarbonization", 1956; 7 - V. P. Grigor'yev, A. F. Vishkarev, B. G. Korolev, Ye. V. Abrosimov, V. I. Yavovskiy. Izv. vyssh. uch. zav. Chernaya metallurgiya, 1960, No. 4). The surface tension was measured with alundum capillaries giving stable indications during one hour when properly prepared. The end to be submerged into metal was turned down from outside and bored to a cone from inside, and the butt surface was ground. As stated in comparison with measurements using alundum and quartz capillaries, with the former the bulb separates mostly from the inner cone in the bored duct, with the diameter between 2.8 and 3.2 mm. The deviation from the true spherical shape of the bulb has to be taken into account in calculations, and this was done using the successive approximation method. Metal was melted in argon carefully purified from oxygen and steam using crucibles cut from magnesite brick. Samples were taken after a constant temperature of  $1575 \pm 10^{\circ}\text{C}$  was reached; after the stabilized bubbling of argon (6-7 bubbles a minute), argon blowing was replaced by nitrogen (at the rate 2.5 - 3.0 lit/min), and the surface tension variations were measured, along with periodical sampling of metal for chemical analysis. The studied metal was killed armco iron

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with 0.03 % C; 0.13 % Mn; 0.18 % Si; 0.020 % S and 0.045 % P. The effect of the third component on the surface activity was studied with additions of electrolytic manganese, crystalline silicon and a synthetic iron-carbon alloy with 2.65 % C; 0.08 % Si and 0.06 % Mn. The N adsorption values were calculated using the Gibbs equation (Russian spelling) which is actually true for binary systems (considering iron-carbon alloy as one component). Conclusions: 1) Nitrogen in liquid iron presents a surface-active component. The surface tension varies with the nitrogen content: it drops when nitrogen is being absorbed, and rises when nitrogen is being liberated. 2) The increase of the carbon content in the iron is accompanied by a weakening surface activity of nitrogen, and the nitrogen adsorption varies in inverse proportion to the carbon content. 3) The effect of carbon on the surface activity of nitrogen is due to carbon adsorption in the surface layers, i.e., the carbon on the surface obstructs the adsorption of nitrogen. 4) The rate of nitrogen absorption and desorption with iron depends on the carbon content in iron; it drops with increasing carbon content. This means that the structure of the surface layer has a considerable effect. 5) The effect of silicon and manganese is analogous to the effect of carbon but less strong. There are 9 figures, 7 Soviet references and 3 English references. The three English language publications read as follows: Ref.1: Card 3/4



The role of surface phenomena in ...

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A161/A030

Chipman and Murphy. Metals Technology, No. 1, 1935. "Iron and Steel Division", AIMME, V - 116, 1935; Ref. 4 - Darken and Curry. Physical Chemistry of Metals; Ref. 8 - V. G. Paranjpe, M. Cohen, M. B. Bever, C. F. Floe. Journal of Metals, 1950, 188, No. 2, 261.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: May 20, 1960

Card 4/4

YAVOYSKIY, V. I.

PHASE I BOOK EXPLOITATION

SOV/5556

Moscow. Institut stali.

Novoye v teorii i praktike proizvodstva martenovskoy stali (New [Developments] in the Theory and Practice of Open-Hearth Steelmaking) Moscow, Metallurgizdat, 1961. 439 p. (Series: Trudy Mezhvuzovskogo nauchnogo soveshchaniya) 2,150 copies printed.

Sponsoring Agency: Ministerstvo vysshego i srednego spetsial'nogo obrazovaniya RSFSR. Moskovskiy institut stali imeni I. V. Stalina.

Eds.: M. A. Glinkov, Professor, Doctor of Technical Sciences, V. V. Kondakov, Professor, Doctor of Technical Sciences, V. A. Kudrin, Docent, Candidate of Technical Sciences, G. N. Oyks, Professor, Doctor of Technical Sciences, and V. I. Yavoyskiy, Professor, Doctor of Technical Sciences; Ed.: Ye. A. Borko; Ed. of Publishing House: N. D. Gromov; Tech. Ed.: A. I. Karasev.

PURPOSE: This collection of articles is intended for members of scientific institutions, faculty members of schools of higher education, engineers concerned with metallurgical processes and physical chemistry, and students specializing in these fields.

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New [Developments] in the Theory (Cont.)

SOV/5556

COVERAGE: The collection contains papers reviewing the development of open-hearth steelmaking theory and practice. The papers, written by staff members of schools of higher education, scientific research institutes, and main laboratories of metallurgical plants, were presented and discussed at the Scientific Conference of Schools of Higher Education. The following topics are considered: the kinetics and mechanism of carbon oxidation; the process of slag formation in open-hearth furnaces using in the charge either ore-lime briquets or composite flux (the product of calcining the mixture of lime with bauxite); the behavior of hydrogen in the open-hearth bath; metal desulfurization processes; the control of the open-hearth thermal melting regime and its automation; heat-engineering problems in large-capacity furnaces; aerodynamic properties of fuel gases and their flow in the furnace combustion chamber; and the improvement of high-alloy steel quality through the utilization of vacuum and natural gases. The following persons took part in the discussion of the papers at the Conference: S.I. Filippov, V.A. Kudrin, M.A. Glinkov, B.P. Nam, V.I. Yavoyskiy, G.N. Oyks and Ye. V. Chelishchev (Moscow Steel Institute); Ye. A. Kazachkov and A. S. Kharitonov (Zhdanov Metallurgical Institute); N.S. Mikhaylets (Institute of Chemical Metallurgy of the Siberian Branch of the Academy of Sciences USSR); A.I. Stroganov and D. Ya. Povolotskiy (Chelyabinsk Polytechnic Institute); P.V. Umrikhin (Ural Polytechnic Institute); I.I. Fomin (the Moscow "Serp i molot" Metallurgical Plant); V.A. Fuklev (Central Asian Polytechnic Institute).

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New [Developments] in the Theory (Cont.)

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and M.I. Beylinov (Night School of the Dneprodzerzhinsk Metallurgical Institute).  
References follow some of the articles. There are 268 references, mostly Soviet.

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Yavoykiy, V. I. [Moskovskiy institut stali - Moscow Steel Institute].  
Principal Trends in the Development of Scientific Research in Steel  
Manufacturing

7

Filippov, S. I. [Professor, Doctor of Technical Sciences, Moscow Steel  
Institute]. Regularity Patterns of the Kinetics of Carbon Oxidation  
in Metals With Low Carbon Content

15

[V. I. Antonenko participated in the experiments.]

Levin, S. L. [Professor, Doctor of Technical Sciences, Dnepropetrovskiy  
metallurgicheskiy institut - Dnepropetrovsk Metallurgical Institute].

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YAVOYSKIY, V I

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PHASE I BOOK EXPLOITATION

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Konferentsiya po fiziko-khimicheskim osnovam proizvodstva stali. 5th,  
Moscow, 1959.

Fiziko-khimicheskiye osnovy proizvodstva stali; trudy konferentsii  
(Physicochemical Bases of Steel Making; Transactions of the  
Fifth Conference on the Physicochemical Bases of Steelmaking)  
Moscow, Metallurgizdat, 1961. 512 p. Errata slip inserted.  
3,700 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii imeni  
A. A. Baykova.

Responsible Ed.: A. M. Samarin, Corresponding Member, Academy  
of Sciences USSR; Ed. of Publishing House: Ya. D. Rozentaveyg.  
Tech. Ed.: V. V. Mikhaylova.

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115

Physicochemical Bases of (Cont.)

SOV/5411

**PURPOSE:** This collection of articles is intended for engineers and technicians of metallurgical and machine-building plants, senior students of schools of higher education, staff members of design bureaus and planning institutes, and scientific research workers.

**COVERAGE:** The collection contains reports presented at the fifth annual convention devoted to the review of the physicochemical bases of the steelmaking process. These reports deal with problems of the mechanism and kinetics of reactions taking place in the molten metal in steelmaking furnaces. The following are also discussed: problems involved in the production of alloyed steel, the structure of the ingot, the mechanism of solidification, and the converter steelmaking process. The articles contain conclusions drawn from the results of experimental studies, and are accompanied by references of which most are Soviet.

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Physicochemical Bases of (Cont.)

SOV/5411

Bogatenkov, V. F., K. T. Kurochkin, and P. V. Umrikhin. Investigating the Permeability of Basic Open-Hearth Slag to Hydrogen 195

Grigor'yev, V. P., A. F. Vishkarev, B. G. Korolev, Ye. V. Abrosimov, and V. I. Yavoyaskiy. Effect of Phosphorus and Manganese on the Surface Tension of Ferrocen Alloys 204

Khitrik, S. I., and Ye. I. Kadinov. Reducing Chromium Losses in Making Stainless Steel With the Use of Oxygen [Blast] 213

[The following persons participated in the research work: A. V. Rabinovich, Yu. V. Chepelenko, V. P. Frantsov, I. P. Zabaluyev, V. F. Smolyakov, P. V. Demidov, M. M. Dovgily, T. M. Bobkov, Ye. I. Moshkevich, A. M. Neygovzen, T. F. Olenich, K. P. Gunaza, B. I. Zlatkina, and Yu. A. Nefedov.]

PART II. CONVERTER PROCESSES

Baptizmanskij, V. I. Certain Problems of the Mechanism and

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S/137/61/000/011/014/123  
A060/A101

AUTHOR: Yavovskiy, V.I.,

TITLE: Main directions of development of scientific research contributions  
in the steel smelting industry

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no.11, 1961, 1, abstract 11V6  
(V sb. "Novoye v teorii i praktike proiz-va martenovsk. stali",  
Moscow, Metallurgizdat, 1961, 7 - 14, Discussion 79 - 88)

TEXT: The author considers the principal problems of scientific research  
in the steel smelting industry, directed at a further improvement of the processes  
of smelting and teeming steel, at a perfectioning of aggregate design, at raising  
the furnace productivity, and at improving the quality of the metal.

I. Polyak

[Abstracter's note: Complete translation]

Card 1/1



KOZLOV, V.I.; YAVOYSKIY, V.I.

Investigating the oxidation reaction of carbon in 500-ton  
open-hearth furnaces. Izv. vys. ucheb. zav.; Chern. met.  
no. 1:46-55 '61. (MIRA 14:2)

1. Moskovskiy institut stali.  
(Open-hearth furnaces--Combustion) (Oxidation)

S/133/61/000/002/001/014  
A054/A033

AUTHORS: Kiselev, A.A., Engineer, and Yavoykiy, V.I., Professor, Doctor of Technical Sciences

TITLE: Improving the Crack Resistance of Steel Ingots

PERIODICAL: Stal', 1961, No. 2, pp. 112-119

TEXT: Cracks originate mainly in low-carbon (0.10-0.25% C) steel ingots, it was found. In order to study the causes of fissuring, tests were carried out with Cr.3 (St.3) and 08Cr (08 sp) steel ingots with the following composition:

	C	Mn	Si	S	P	Cr	Ni	Cu	Al
St.3:	0.19	0.45	0.16	0.025	0.013	0.21	0.16	0.13	-
08 sp:	0.10	0.36	0.09	0.021	0.014	0.17	0.15	0.13	0.03

During the pouring process it was found that in the initial period of crystallization the solidification of the ingot, in vertical direction and along

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Improving the Crack Resistance of Steel Ingots

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the periphery, does not take place at a uniform rate: (see fig.2)

Section according to fig.2:	I	II	III	IV	V
Time of solidification, min	1.2	1.5	1.8	2.3	2.8
Distance of the section from the bottom, mm	1500	1200	900	600	300
Thickness of the skin in the middle of the edge, mm					
$\delta_1$ (edge A)	22	26	30.5	33	39
$\delta_2$ (edge B)	22	26	32	35	43
Non-uniformity coefficient of solidification, $\delta_1 : \delta_2$	1.0	1.0	0.95	0.94	0.91

With regard to the spot where the skin is the thickest, the following data were obtained: (for ingots with wavy surface)

Section according to fig.2:	I	III	IV	V
Interval of solidification, min	1.2	1.8	2.3	2.8
Thickness of the skin, mm in the corner of the ingot	15.5	23.5	25.0	32.0

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in the projecting part of the wavy surface	23.0	33.0	36.0	37.5
Non-uniformity coefficient of solidification	0.67	0.71	0.70	0.85

The rate of solidification was also studied in 18XГТ (18KhGT) ingots (6.1 ton) and it was found that this rate is slower in the surface layers than in the lower ones: at 100 mm from the ingot mold wall in the bottom part (circulation zone of the metal) the coefficient of solidification rate amounts to 3.9 cm/min<sup>0.5</sup>, while at 65 mm depth in the top (1100 mm from the bottom) only to 2.3 cm/min<sup>0.5</sup>. As to temperature changes, it was found that in the upper half of the ingot the cooling rate of the outer layers is higher than that of the inner layers, while in the lower half of the ingot the opposite was observed. This non-uniform cooling on the periphery and towards the centre of the ingot causes irregular linear contraction in the initial phase of crystallization, with alternating compression and expansion stresses in the surface layers of the ingot, which results in cracks. Another factor playing a part in fissuring is the relation between the thickness of the solid and solid-liquid elements of the skin in the early stages of crystal-

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lization. When the solid-liquid elements (having a low strength) develop considerably, the crack resistance of the ingot decreases. The development of the solid-liquid zone in the corner of the ingot bottom - when the case is thin - corresponds to the formation of cracks mostly in these areas. The strength and plasticity of the case was studied in the 1,300-1,125°C heat range (for each 25-50°C) with electro-heating of the specimens for 7-10 minutes. The test results showed that in the heat interval indicated the case of the ingot shows a high plasticity. The strength limit of St.3 ingots between 1,125-1,300°C is relatively low (3.0 and 1.2 kg/mm<sup>2</sup> respectively), while the strength limit in the case of 08sp ingots at 1,250°C is by 0.1-0.3 kg/mm<sup>2</sup> lower than for St.3 steel with a higher C-content. The strength limit (for St.3 ingots) in the lower part was found to be about 0.1-0.2 kg/mm<sup>2</sup> higher, than in the top, due to the shorter time of crystallization in this area and the more intensive development of the solid-liquid element at the moment of pouring. In the inner part of the case, in which at the moment of pouring the solid-liquid element prevails, the strength limit is 0.2 kg/mm<sup>2</sup> lower (1.4-1.7 kg/mm<sup>2</sup>) than in the completely solidified outer layer (1.52-1.77 kg/mm<sup>2</sup>). The main cause of cracking evidently is the intensive linear contraction of the ingot, which, when delayed, results in contracting

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stresses. The appearance of these stresses is also promoted by the non-uniform contraction in the height and periphery of the ingot. With regard to the effect of impurities (sulfides, FeS.MnS, globular inclusions, oxides) it was found that these prevail in the parts of the ingot where the case is insufficiently wetted by the circulation metal. Intensified deoxidation of the metal (by adding aluminum) increases its resistance to cracking increases. This was observed in the zavod Krasnyy Oktyabr (Krasnyy Oktyabr Plant), when 1,200-2,000 g aluminum/ton of armco steel was added. The following data were obtained for these tests:

Amount of aluminum added in the ladle,

g /ton steel	1200-1350	1400-1500	1600-1700
Amount of heats	6	10	10
Amount of sound ingots, %	46	69	82

When the aluminum content is raised, the amount of oxygen adsorbed by the metal decreases, which contributes to a reduction in red shortness. According to tests of the Red Oktyabr Plant the cracking of steels with a C-content below 0.25% can be prevented when their residual Al-content is  $[Al] : [C] \geq 0.10$ . The indicated amount of residual Al can be obtained by adding the following quantities of Al:

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At a C-content of the steel of, %: 0.20-0.25 0.10-0.15 armco  
the required Al-content, g /t: 1200-1300 1350-1500 1800-2000

Based on these tests the process of cracking can be summarized as follows:  
cracks originate mainly in the corners of the lower half of low-carbon steel  
ingots with fewer cracks on the bent sides. This type of steel shows a  
higher degree of linear contraction, than medium and high-carbon steels. In  
the upper part of the mold the contraction of the ingot is even, in the low-  
er half, however, irregular gaps form between the ingot and the mold. The  
uneven contraction in this area is caused by the effect of the circulating  
liquid metal flow on the crystallizing case of the ingot, changing the tem-  
perature of the case along the periphery and the crystallization rate. If  
the contraction is slowed down owing to the roughness of the mold surface  
or because of the ingot sticking to the mold wall, contraction stresses  
arise in the case which are proportional to the linear contraction. Due to  
the non-uniform rate of cooling in the lower half of the mold, opposing  
stresses (expanding and compressing) develop and they promote cracking. In  
order to increase the crack resistance of low-carbon steels, the rate of  
pouring has to be slowed down and cooling accelerated by enlarging the ingot  
periphery. This can be attained by giving the ingot a wavy surface. Another

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efficient measure is to raise the residual Al-content to Al : C 0.10.  
There are 7 figures and 11 Soviet references.

ASSOCIATION: Zavod "Krasnyy Oktyabr" ("Krasnyy Oktyabr" Plant) and Moskovskiy institut stali (Moscow Steel Institute)

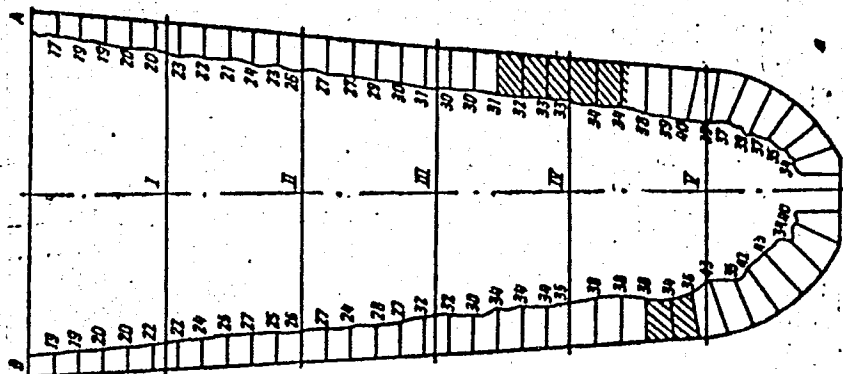


Figure 2a

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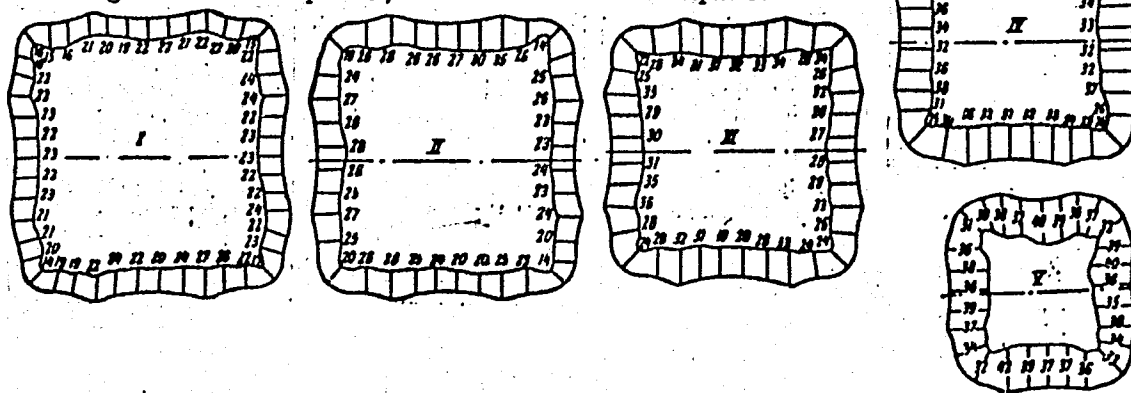
Improving the Crack Resistance of Steel Ingots

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Figure 2

Change of the case-thickness in St.3 ingots:

a - longitudinal template; b - transverse templates

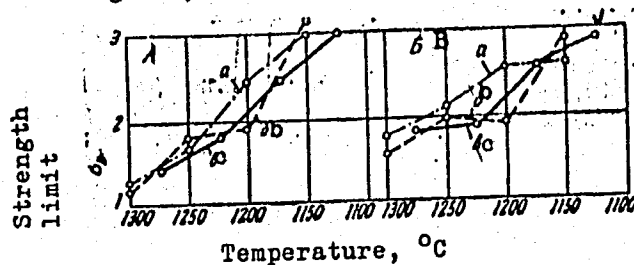


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Figure 5



Change in the strength limit of the case in the top (A) and bottom (B) of an St.3 ingot at high temperatures

- a - samples from the corner of the case
- b - from the central part of the side
- c - from the projecting parts

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# Improving the Crack-Resistance of Steel Ingots

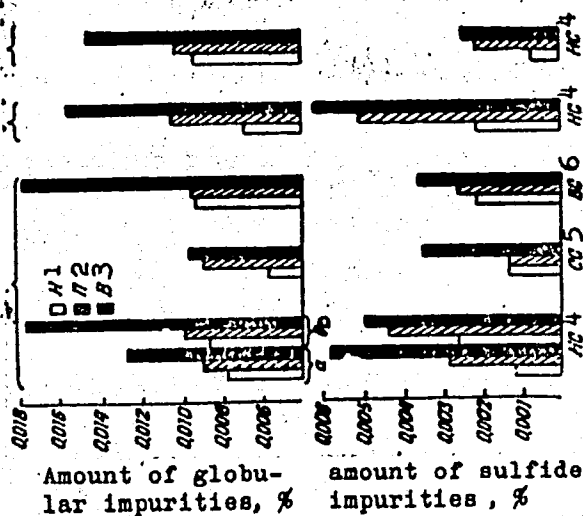
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A054/A033

Figure 6:

Change in the amount of non-metallic impurities vertically and in the section of the ingot case

- 1 - external zone
- 2 - intermediate
- 3 - inner
- 4 - ingot bottom
- 5 - middle of the ingot
- 6 - ingot top
- a - side, remote from the centre
- b - side, near the center

on the side in the in the corner projection



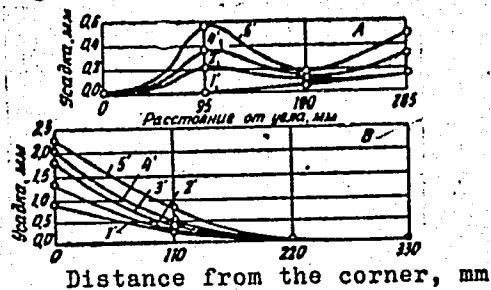
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Improving the Crack Resistance of Steel Ingots

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contraction, mm

Figure 7



Deformation of the case in cross section of the ingot (contraction), in the initial period of crystallization (steel 30T, bottom casting)  
A - lower section of the ingot  
B - upper section of the ingot (figures on the curves: duration of crystallization of the ingot, min.)

Card 11/11

DZHOSHI, V.B.; VISHKAREV, A.F.; YAVOYSKIY, V.I.

Role of surface phenomena in processes of hydrogen distribution  
between metal and the gaseous phase. Izv.vys. ucheb. zav.; Chern.  
met. no.3:23-30 '61. (MIRA 14:3)

1. Moskovskiy institut stali.  
(Surface chemistry) (Steel--Hydrogen content)

YAVOYSKIY, V.I.

18 3200

30879  
S/148/61/000/009/001/012  
E071/E135

AUTHORS: Yavoyskiy, V.I., Chernega, D.F., Dudko, D.A.,  
Tyagun-Belous, G.S., Bektursunov, Sh.Sh.,  
Bocharov, V.A., Agamalova, L.L., Molotkov, V.A.,  
Yakobshe, R.Ya., and Pofanin, Ye.M.

TITLE: Electrolytic phenomena in the process of electrosag  
heating of ingots

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya  
metallurgiya, no.9, 1961, 32-43

TEXT: Electrosag heating of ingots is based on the ionic  
nature and structure of slag. On passing a current through the  
slag, situated on the surface of the shrinkage head, a considerable  
amount of heat is evolved, sufficient to maintain the slag and  
metal in the upper part of the ingot during its crystallisation  
in the molten state. The object of the present investigation was  
to elucidate the influence of the kind of electric current on the  
processes taking place during electrosag heating of ingots. It  
is advantageous to carry out the heating of the ingot tops in such

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a manner that in addition to increasing the yield of good metal there should be an improvement in the metal quality resulting from the electrolytic effect and also from the transfer of a part of the segregating elements into the slag. The experiments were made with four ingots of a square cross-section, weighing 3.4 tons, of steel 10G2SD (10G2SD), smelted in 75 ton basic open hearth furnaces. The electroslag heating was with direct and alternating current. For the first ingot the electrode introduced into the head part was connected to the cathode and the plus to the ingot (straight polarity); the second ingot was heated with direct current of reverse polarity (minus to the bottom of the mould, plus to the electrode in the head part); the third ingot was heated with a 50 c.p.s. alternating current; the fourth ingot was cast by the usual practice and was used as a blank experiment. The first three ingots were top poured through an intermediate funnel and the fourth ingot was bottom poured. A generator capable of producing 1000 A at 60 V was used for heating with direct current. The heating conditions were as follows: voltage 48 V, current for the first 60 minutes 950 A and then

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700 A; the duration of heating 90 minutes. The flux for the formation of slag consisted of 25% fluorospar, 45% finely crushed freshly ignited lime, 30% chamotte powder. The ingots were rolled into slabs 500 x 250 mm. Four templets were cut from each slab and then cut into strips from which test specimens were made. Non-metallic inclusions were determined metallographically and electrolytically. It was found that the distribution of non-metallic inclusions in the ingot was the most advantageous on heating it with direct current of "straight" polarity. This type of heating lowers chemical non-uniformity in comparison with ingots cast by the usual works technology and heated with alternating current, or direct current of reverse polarity. There is a tendency for sulphur to be shifted towards the positive pole, whereupon sulphur near the positive pole is distributed unevenly along the cross-section of the ingot in the form of segregation "spots". No shift of carbon towards the negative pole was established. During the heating with direct current of straight and reverse polarity, in addition to electrolytic phenomena, the Perrin-Tochinskiy effect leading to the refining

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of the metal of the head part of the ingots was observed. No noticeable effect of direct current on changes in the content and distribution of nitrogen in the rolled metal was observed. It was established that the content of hydrogen in the shrinkage head decreases during crystallisation of the ingot heated with a direct current of reverse polarity and increases with direct polarity (minus on the electrode). The mechanical properties of the metal of the ingot tested with heating by current of direct polarity are most uniform throughout the whole volume of the slab. The specific gravity of the metal of all the ingots was almost the same. The pickling ability of the metal (weight loss of cylindrical specimens in a solution of 65 wt. parts of HCl, 25 wt. parts of H<sub>2</sub>SO<sub>4</sub> and 10 wt. parts of water at 70 °C during 40 minutes) along the whole slab is the highest on heating with direct current of "straight" polarity and lowest on heating with current of reverse polarity. On heating with alternating current of an industrial frequency the quality of the ingot metal was better than that of the "blank" ingot and was nearly the same as on heating with direct current of "straight" polarity.

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There are 6 figures, 4 tables and 9 references; 8 Soviet-bloc  
and 1 non-Soviet-bloc.

ASSOCIATION: Moskovskiy institut stali  
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YAVOYSKIY, V.I.

S/148/61/000/009/002/012  
EO71/E135

AUTHORS: Bektursunov, Sh.Sh., Yavoyskiy, V.I., Chernega, D.F.,  
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TITLE: The behaviour of hydrogen during electroslog heating  
and supplementary feeding of ingots

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya  
metallurgiya, no.9, 1961, 44-53

TEXT: The authors carried out experiments on electroslog  
heating and supplementary feeding of 8.2 ton sheet ingots of a low  
alloy steel MK 10Г2СД (10G2SD) on a large scale experimental  
installation in which samples of the metal and slag were taken  
during the course of crystallisation of the ingots for the  
determination of hydrogen. The chemical composition of the steel  
was:  $\leq 0.12\%$  C; 1.3-1.65% Mn; 0.8-1.1% Si;  $\leq 0.30\%$  Cr;  
 $\leq 0.30\%$  Ni; 0.15-0.30% Cu; 0.02% Ti,  $\leq 0.040\%$  S and P. The  
process was carried out as follows: After filling the mould up to  
about one third of the height, a slag forming mixture was placed  
on the surface of the metal; 10-12 min after filling the mould,  
three electrodes were introduced into the slag, current (55-60 V,  
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1000-1400 A) was switched on and an additional amount of the slag forming mixture added so as to form a slag bath 80-100 mm deep. The duration of heating and supplementary feeding was 60-65% of the time necessary for the complete crystallisation of the ingot in normal production (about 2 hours). The slag forming mixture consisted of 40 kg chamotte powder, 60 kg lime and 10 kg spar concentrates. The slag formed had the following composition: 26-28% SiO<sub>2</sub>; 38-40% CaO; 16-18% Al<sub>2</sub>O<sub>3</sub>; 1.0-1.5% FeO; 0.2-0.6% Fe<sub>2</sub>O<sub>3</sub>; 1.0-1.3% MnO; 5.0-7.0% MgO; 6-8% CaF<sub>2</sub>; 0.02-0.03% P<sub>2</sub>O<sub>5</sub>; and 0.006-0.010% S. The lining of the top was made from magnesite brick. Samples of the metal were taken from the shrinkage head with a silica tube and samples of the slag from the space between the central and one of the peripheral electrodes with a metallic spoon. The extraction of the gas from the samples was done at 950-1000 °C at  $3-5 \times 10^{-2}$  mm Hg. To elucidate the influence of the heating on the residual hydrogen content in the metal, four transverse and one longitudinal templets were cut from three ingots (one of the ingots teemed by the usual technology was used for comparison). It was found that in the shrinkage head and 100 mm below the head, the content of hydrogen

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